BY ORDER OF THE COMMANDER
HILL AIR FORCE BASE (AFMC)

HILL AFB INSTRUCTION 21-102

19 AUGUST 1999

Maintenance

CONTROL OF HYDROGEN EMBRITTLEMENT AND STRESS RELIEF BAKES

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements *AFPD 21-1, Managing Aerospace Equipment Maintenance.* It establishes procedures for precise control and verification of the 350 to 400 degree Fahrenheit baking operations required on high-strength steel components within the HIndustrial Operations Division (OO-ALC/LIO). It applies to the Commodities Directorate (OO-ALC/LI) and the Technology and Industrial Support Directorate (OO-ALC/TI). This instruction does not apply to Air Force Reserve or Air National Guard organizations on Hill AFB.

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SUMMARY OF REVISIONS

This revision realigns the publication designation from OO-ALC-HAFB Instruction 21-102 to Hill AFB Instruction 21-102. Updates organizational office symbols in the purpose paragraph and paragraphs 2.1 and 2.4; deletes reference to paint in paragraph 1; changes existing paragraph 3 to ready title only; text from paragraph 3 incorporated into 3.1. with the following changes: “and above” inserted after UTS and “for four hours” inserted after “must be baked;” specific operations in existing paragraph 3 changed to “prior to any rework operations and following any grinding operations;” added paragraph 3.2 sentence 1; last sentence of paragraph 3 was moved to end of 3.2; AFMC Form 958 was deleted from paragraph 4.1.1. and paragraph 4.1.4.3., note: line 1, is rewritten to read “Whenever a new procurement of temperature sensitive paint . .; paragraph 4.2 added “Short duration interruptions are acceptable . .” and paragraph 4.3. deleted. A (|) indicates revision from previous edition.

1. BACKGROUND: High-strength steel parts must be baked at 350 to 400 degrees Fahrenheit prior to any rework and after grinding operations to remove residual stresses, and after each plating, nital etch, and certain stripping operations in order to remove absorbed hydrogen.

2. MAINTENANCE AND INSPECTION OF EQUIPMENT: Maintenance and inspection of the baking ovens used to bake aircraft and missile components must consist of the following:

2.1. Equipment Maintenance Branch (OO-ALC/TIPM) will perform periodic preventive maintenance. All repairs or adjustments to the oven will be accomplished by OO-ALC/TIPM.

2.2. Material Science and Engineering Laboratory Section (OO-ALC/TIELM) will periodically conduct temperature uniformity surveys of the working area of all ovens.

2.3. Precision Measurement Equipment Laboratory (PMEL) Branch (OO-ALC/TIPL) will accomplish accuracy checks on temperature measuring and controlling instruments on stress relief furnaces.

2.4. Personnel from the Metal Processing Section (OO-ALC/LIOPB) and E&I/Strip/ Blast unit (OO-ALC/LIOPSE) will inspect recorders daily for operability and sufficient chart paper. The operator for each shift will check the recording controls for the proper operation and make sure the ink is recording the temperature on the chart paper.

3. MATERIALS REQUIRING BAKING:

3.1. All high-strength steel parts having a tensile strength above 180,000 pounds per square inch (psi) ultimate tensile strength (UTS) must be baked for four hours at 350 to 400 degrees Fahrenheit prior to any rework operations and following any grinding operations.

3.2. All steel part having a tensile strength of 180,000 psi UTS and above must be baked in accordance with the applicable specification. All steel parts to be baked will be marked with a temperature sensitive material as described in paragraphs 4.1.2., 4.1.3., and 4.14.

4. BAKING OPERATIONS:

4.1. The oven operator must:

4.1.1. Annotate the time in and time out on the work control document.

4.1.2. Mark all major steel parts large enough to enter the bake ovens individually with a temperature sensitive material with a range of 350 to 400 degrees Fahrenheit. Each part must be marked by a dot or line made with fresh paint.

4.1.3. Mark at least one component in each batch of small parts, such as nuts, bolts, etc., which enter the ovens in a basket or single batch with temperature sensitive paint.

4.1.4. Use the following temperature-sensing paints (or their equal) which are authorized to be applied to steel parts prior to baking.

4.1.4.1. Everlube Corporation, Tempadot H2 Embrittlement Lacquer.

4.1.4.2. Teletemp Corporation, 2830/5 Paint.

4.1.4.3. Tempil Corporation, Temp-Alarm 44C Paint.

NOTE:

Whenever a new procurement of paint is obtained, a sample from this shipment must be submitted to OO-ALC/TIELM for testing to determine that it meets specifications. Only paints that have been so tested and found to meet specifications will be used in the production shops as indicators of proper baking procedures.

4.1.5. Inspect the marked areas when the component leaves the oven for proper color change as indicated on the container.

4.1.6. Recycle component through the baking procedure if the paint does not change color as it should or if the oven malfunctions during the bake cycle. The rebake must also be annotated on the work control document.

4.2. Parts that have been plated or replated during overhaul must enter the bake ovens within the times described in paragraph 3 and complete the entire bake cycle without interruption. Short duration interruptions are acceptable provided the interruption is not included in the total bake time.

KENNETH I. PERCELL, Director
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